GOVERNMENT
1879
N.W.P.

No. 2052A. / 11 of 1878.

FROM

THE DIRECTOR, DEPT. OF AGRI. AND COMMERCE,

N.-W. PROVINCES AND OUDH,

TO

THE SECRETARY TO GOVERNMENT,

N.-W. PROVINCES AND OUDH.

Dated Cawnpore, the 13th November, 1878.

SIR,

I HAVE the honour to submit the reports on the Allahabad and Cawnpore farms.

2. As the report of 1876 explained the nature of the work performed at the two farms, and the character of the land comprised in them, it will be sufficient to quote the paragraph which headed the report of last year: "The general outline of the programme sketched in 1876 was that the Allahabad farm, which was badly situated for experimental purposes, should be retained, at any rate so long as the present arrangement with the Superintendent lasted, in conjunction with a municipal sewage farm, for the main purpose of proving the value of city manure when properly utilized; and that the Cawnpore farm, to which is attached a valuable garden, and where plentiful irrigation is available, should be maintained as a distributing centre for trees and plants, as well as an experimental farm."

ALLAHABAD FARM.

3. It is now well understood that the principal object of the Allahabad farm is to carry out the attempt to utilize profitably the sewage of a city, but, in accordance with the system adopted last year, an account will be given first of other experiments which have been conducted. Mr. Phillips is still in charge of the farm. He has sent in an interesting report, which, however, being somewhat wanting in method and detail, has entailed further correspondence, the whole of which I submit in original to Government, marking those portions which I think it may be desirable to print as an appendix. In this review I attempt to draw up a clear abstract of the substance of Mr. Phillips' report.

4. The area of the land originally occupied as Government farm was 153 acres, of which I have on former occasions reported that the greater part is rented in order to prove (by the increased rental obtained) the benefit of a deep-ploughing system. The area reserved for experiment has this year been—

	Acres.	Roods.	Poles.	
	11	2	2	under sorghum.
	4	2	2	„ joar.
	7	2	0	„ bajra.
	5	1	1	„ barley.
	1	0	0	„ sugarcane.
	1	0	0	„ hariali grass.
Total ...	30	7	5	

5. The experiments to which the crops enumerated above have been subject are to show the effects—

(1) of deep ploughing;
(2) of early and late ploughing;
(3) of manure;
(4) of thin sowing.

6. Before showing the results of experiments enumerated in para. 5, I will give a brief abstract of the Superintendent's account of the season and crops. 1877 was the year of drought, and, as regards outturn therefore, results were, compared with those of other years, a failure ; at the same time it is interesting to know how far a better system of cultivation may, in a year of drought, have made results on the farm superior to those on lands in the neighbourhood. I impressed this early in the year on the Superintendent, but the comparison has not been quite so clearly worked out as I could have wished.

7. *Sorghum* always occupies a large area, because it is found a useful fodder for the Commissariat. Acres 11·2-2 were under this crop, of which there were—

A.	r.	p.	
1	2	0	English ploughed with bazar sweepings.
1	2	0	English ploughed without manure.
0	3	0	Native ploughed with bazar sweepings.
0	3	0	Native ploughed without manure.
0	0	2	Native ploughed with poudrette.

8. The following table gives results for 1876 and 1877 :—

		Outturn per acre in maunds (fodder.)	Expenditure per acre.	Value per acre.	Profit per acre.
			Rs.	Rs.	Rs.
English ploughed and manured	1876	300	21	27	6
	1877	165	23	27	4
Ditto and unmanured	1876	265	17	24	7
	1877	163	19	27	8
Native ploughed and manured	1876	226	19	21	2
	1877	131	20	22	2
Ditto and unmanured	1876	219	16	20	4
	1877	80	16	13	3
Ditto and manured with poudrette ...	1876	336	28	31	—3
	1877	214	22	36	14

The profits throughout are small, the reason being that hired labour near a city is expensive. The remark may be made, once for all, that we cannot hope to make experimental agriculture profitable, the object of the experiments being not profit, but comparison of results.

The above figures will be criticised in the paragraphs which discuss separately the results of each system applied to all the crops of the year. It is sufficient to notice now the good results brought out by English ploughing and poudrette.

9. *Joar.*—The following table is given by Mr. Phillips for 1877—

	Outturn per acre.		Value per acre.	Expenditure per acre.	Profit per acre.
	Grain.	Straw.			
	Mds.	Mds.	Rs.	Rs.	Rs.
English ploughed and manured ...	22	76	56	28	28
Ditto and unmanured ...	24	76	60	24	36
Native ploughed and manured ...	16	68	43	25	18
Ditto and unmanured ...	15	61	41	21	20
Ditto with poudrette ...	16	48	40	27	13

The superiority of the English plough is again marked. Manure actually decreased the outturn—a result attributed by Mr. Phillips to the drought, the heat of which was intensified by the heat of manure.

10. *Bajra* was not the subject of experiment, and details are not given by the Superintendent.

11. *Wheat.*—The following table is given by Mr. Phillips :—

Outturn in maunds per acre.

	English ploughed.		Native ploughed.	Percentage of increase due to English plough.
	Mds.	s.		
Manured	4	0	2	100
Unmanured	2	18	2	22
Poudrette	...		3	...

" The results were very meagre, and are due undoubtedly to the want of irrigation, which I have represented in former reports as destroying the value of the Allahabad ground as an experimental farm, and as the reason why I have reduced the area of experimental land within such narrow limits. The absence of irrigation was in fact, as Government is aware, the cause of the proposition to close the farm, which has only been retained on account of the interest attached to the sewage experiment and the value of Mr. Phillips' services in the public gardens."

12. *Barley.*—The following table is given by Mr. Phillips :—

Outturn in maunds per acre.

	English ploughed.	Native ploughed.	Percentage of increase due to English plough.
Manured	24	11	118
Unmanured	16	9	77
Poudrette	...	12	...

The same remarks apply as in the case of wheat. Absence of water resulted in very poor outturns, though not so much reduced as in the case of wheat, which requires more irrigation than barley. English ploughing was again successful.

13. *Hariali grass.*—I quote Mr. Phillips' account of the experiment made with this grass, which does not appear to differ much from the common *dúb* of the North-Western Provinces. The value of results are obscured by the nature of the season :

" For the experiment in 1877-78 one acre of ground was reserved; this ground was not manured for the Hariali grass, but had been manured in 1875 and in 1876, two successive seasons, and was in capital condition. The ground was once English ploughed, and four times native ploughed to level and pulverize the surface soil ; it was then divided into four different quarters of a quarter acre each, and sown on the 1st of July. No. I., one quarter was dibbled in by hand. No. II., one quarter sown over the surface of the ground, and afterwards covered over with about ¼ to ½ an inch of dry soil, similar to the way in which lawns are put down. No. III., one quarter sown broadcast over the ground and ploughed in by the native plough, as you would sow any of the kharif crops. No. IV., one quarter was sown in the furrow after the native plough and planked over, as you would sow barley, to test which was the most economical and best way to put down the grass, and which gave the quickest growth, and consequently the greatest outturn.

" Statement A appended will show the outturn from the first cutting, the expenditure per acre, &c. No. I. is the old and most usual method by which this grass has been planted, but as dibbling is a very dilatory and expensive process and would never suit agriculturally, especially where a large extent of ground had to be planted, for grazing or cutting, the experiment was therefore divided into the four different heads as already denoted. No 1 cost Rs. 24 per acre and only gave an outturn of 62 maunds 20 seers per acre ; while No. 3, at a cost of Rs. 18-8-0 per acre, gives an outturn of 65 maunds 8 seers per acre. This was to have been expected, as the men in the operation of dibbling in the grass have to travel over the ground so much, which leaves it firm and hard, and the plants do not grow so well in it; while in No. 3 the ground is left loose and soft, and is not tramped over after it is sown, and the grass grows so much the more luxuriantly in the soft loose soil. No. 4 is little different from No. 3, the system of planting being very similar ; but by sowing in the furrow the grass is buried a little deeper, and therefore takes longer to come through the ground. No. 3, consequently, gains on the other and has a longer growing period, which is of great consequence, especially at the beginning of the season, when there is plenty of heat and moisture.

" The style of sowing No. 2 is only suitable for laying down lawns, or where the ground is required very level and even; the grass being completely covered, it roots and spreads considerably before it appears above the surface, which it does regularly and evenly; by this time, however, it has lost the start of the others, hence the smaller outturn from the first cutting. It, however, comes up thicker, and in a good season would probably give as great or greater an outturn than the others at the end.

Altogether, I therefore consider that No. 3 is the best system for planting for agricultural purposes, as it leaves the ground soft and loose for the plants to thrive in, and it is the cheaper way of putting down the grass. The outturn from this season's experiments, however, I do not consider as perfectly conclusive, owing to the great want of rain; and arrangements have been made to sow again this season, under the same conditions as last year. The old experimental plots will also be left and the produce carefully weighed, so that we may be able to test this year's experiment with last year's.

"This grass, *Cynodon dactylon*, is very like the common *dûb* (*Agrostis linearis*), but is of a more slender and longer growth, and gives every promise to turn out a good fodder crop; at present (1st June) it is of a good colour and quite green, and seems as if it would make a good grazing crop during the hot season, when other green food is so scarce. I do not, however, like to pass a decided opinion on this point yet, as the strength and colour of this grass at present may be owing to the deep and well-prepared ground on which it is growing; and, having no *dûb* under the same circumstances, it is difficult to say that the *dûb* under the same conditions would not be as good. One plot of *dûb* will be included in this experiment this year, to test the value of the two grasses under the same conditions."

14. *Reana luxurians* and *Cuzce maize* (grown in one of the gardens), *oats*, and *Bakla beans* failed, probably on account of the drought.

15. I now pass to what are really the interesting points of the experimental cultivation, *viz.*, the comparative effects of different methods of treatment. English ploughing comes first. It may be divided under two heads—early ploughing *versus* late ploughing; English ploughing *versus* Native ploughing.

16. Credit is due to Mr. Phillips for having instituted a trial of early ploughing, which has each year indicated valuable results. There are, however, difficulties in the way of its general introduction. When no rain falls, ground in the uplands is too hard, unless easy means exist for irrigation, and even where, as in the low land of the Allahabad farm, soil is less baked and hardened than in higher ground, still a larger amount of bullock power is required than natives can generally spare. It must not be supposed either that natives are completely unaware of the benefit of early ploughing, for no one who has had the opportunity of witnessing the eagerness with which cultivators take out their ploughs after an early fall of rain can doubt their appreciation of the system. The influence of the hot-weather sun on soil upturned, especially by the English plough, must, of course, be very great. The direction in which advantage may be taken of the utility of Mr. Phillips' experiment is, I suspect, in attempting to introduce early ploughing in canal-irrigated villages, and I propose to institute experiments next year in some of the Court of Wards' estates where suitable conditions exist. Should the trial be found successful, it may be expedient to give canal water at a nominal rate, in the early months of the year, wherever there may be a surplus supply, which, as cane and indigo are at that season the only crops of any importance under irrigation, will often be available.

17. I quote below Mr. Phillips' statement of the results of early *versus* late ploughing, but I regret that they have been confined so exclusively to sorghum; next year they are to be extended to other crops, grain as well as fodder :—

"*English early and late ploughing.*—Two acres of sorghum were sown to test the value of late and early ploughing.

"The following statement will show the results of this experiment for the last four years :—

Year.	Crop.	Outturn per acre early ploughed.	Outturn per acre late ploughed.
	Fodder.	Mds.	Mds. s.
1874-75	Joar	329	239 3
1875-76	Sorghum	450	340 0
1876-77	Ditto	366	300 0
1877-78	Ditto	222	150 30

"It is thus seen that the early ploughed ground gives an average of over one-third more than the late ploughed ground in the four years, *i.e.*, from 1874-75 till 1877-78; the difference during the hot dry season, however, is much greater, the early ploughed ground giving half more than the late ploughed—This is something almost startling when we come to consider that all the conditions were the same. English plough, manure, and altogether, the only difference being in the time of ploughing; the early plot was ploughed in January, while the late plot was ploughed in June, after the first shower of rain had fallen, the usual time when the native cultivators begin to plough their fields. This, as before explained, is due to the effects of the English plough turning up the soil to the influence of the hot air and sun, which pulverizes the ground, making it mellow and free, and makes active the inorganic ingredients of the soil for the use of the plants, likewise securing the organic ingredients as they descend with the rains."

18. The following table shows the general results of English plough *versus* Native plough for 1876 and 1877 :—

Name of crop.	Grain or fodder.	*Outturn in maunds.* English ploughed.	Native ploughed	Percentage of increase due to English plough.
		Mds. s. c.	Mds. s. c.	
Sorghum, 1876	Fodder ...	300 0 0	226 26 0	32
Sorghum, 1877	...	165 14 0	131 29 0	25
Joar ... 1876	Fodder ...	...	...	No joar was sown this year.
	Grain ...	...	...	
Joar ... 1877	Fodder ...	76 0 0	68 26 0	11
	Grain ...	21 20 0	16 0 0	34

19. I quote Mr. Phillips' report under the head of English ploughing. The account, however, is not sufficiently statistical:—

"During the hot, dry, burning weather we had last year, when we should have been having the rains, there was such a great difference in the appearance of the crops in each plot that I asked the Commissioner, Mr. Plowden, and the Collector, Mr. Quinton, to the farm, to inspect them on the English ploughed, and especially on the early ploughed, ground. The plants looked quite fresh and green and did not seem to suffer from the want of the rain, while all around on the native fields the crops were yellow and burnt up. I quote from a letter received from Mr. Plowden, after his visit of inspection to the Farm :—

" 'This is an interesting return, and I am gratified to find the experiments in the farm succeeding so well. While the want of rain was pressing so heavily on all the autumn crops, how wonderfully well these experimental patches of autumn crops were looking. They were looking much the same as in an ordinary season, while the neighbouring crops had either not come up or were stunted and dwarfed.'

"Although the plants looked so well, yet, as a glance at the statement will show, they did not produce such a heavy outturn as in ordinary seasons; this was to have been expected, although for the season we had the outturn was great, and a fair crop for any season."

Statement showing the measurements of the crop on each plot taken on the 1st of October.

Number.	Nature of ploughing.	Crop.	Height.	Remarks.
			feet.	
1	English ploughed with manure ...	Sorghum...	8	Rather patchy here and there, but good.
		Joar ...	6½	Green and good, but patchy.
2	Ditto without do. ...	Sorghum...	8	Rather yellow
		Joar ...	6	Fair, but patchy.
3	Native ploughed with do. ...	Sorghum...	6	Yellow and dry.
		Joar ...	5½	Rather yellow and patchy.
4	Ditto without do. ...	Sorghum...	5½	Yellow and partially burnt up and patchy.
		Joar ...	5	Rather yellow and patchy.
5	Ditto and manured with poudrette ...	Sorghum...	8	Green and good.
		Joar ...	5½	Good, but patchy.
6	English early ploughed with manure,	Sorghum...	11	Splendid, regular and green.
7	Ditto late ditto ...	Ditto ...	7½	Rather yellow and drying.

20. The following table shows the result of manuring :—

	Manured ordinary.	With poudrette.	Unmanured.
Fodder.	Mds.	Mds.	Mds.
Sorghum (fodder crop), English ploughed	300	...	265
Ditto ditto Native ditto	226	336	218
Bajra, ditto English ditto	212	...	207
Do. ditto Native ditto	146	128	125
Grain.			
Bajra, English ploughed	18	...	16
The same crop as above Native ploughed	17	20½	10

21. The following is the result of the thin sowing experiment, to which the Government of India drew especial attention last year. I quote Mr. Phillips' report:—

"*Thin seeding.*—Six acres were reserved for this experiment and were divided as follows :—3 acres of barley and 3 acres of wheat, which were again divided into ½ acre plots, 6 plots for wheat and 6 for barley. The wheat was sown at the rate of 23, 28, 33 38, 43, and 48 seers per acre ; the barley at 20, 25, 30, 35, 40, and 45 seers per acre, respectively, to test and compare the effect of different quantities of seed sown.

"*Statement showing the effect of different quantities of seed, sown of wheat and barley.*

	Crops.	Quantity of seed sown.	Outturn per acre. Grain.		Outturn per acre. Straw.		Value per acre.	Expenditure per acre.	Profit per acre	Loss per acre.
		Seers.	Mds.	s.	Mds.	s.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
English ploughed and manured ...	Wheat,	23	5	32	40	...	34 8 0	35 10 0	...	1 2 0
Ditto ditto ...	Do.,	28	4	...	40	...	28 12 8	36 4 0	...	7 7 4
Ditto ditto ...	Do.,	33	6	6	38	...	34 14 0	36 14 0	...	2 0 0
Ditto ditto ...	Do.,	38	4	...	42	20	29 12 8	37 8 0	...	7 11 4
Ditto ditto ...	Do.,	43	4	20	45	...	32 6 2	38 2 0		5 11 10
Ditto ditto ...	Do.,	48	5	10	40	...	34 6 6	38 12 0	...	4 5 6
Ditto ditto ...	Barley,	20	10	19	20	...	34 8 0	33 12 0	0 7 0	...
Ditto ditto ...	Do.,	25	20	10	40	...	66 10 0	34 0 0	32 10 0	...
Ditto ditto ...	Do ,	30	20	4	40	...	66 4 0	34 4 0	32 0 0	...
Ditto ditto ...	Do.,	35	20	..	40	...	66 0 0	34 8 0	31 8 0	...
Ditto ditto ...	Do.,	40	20	5	40	...	66 5 0	34 12 0	31 9 0	...
Ditto ditto ...	Do.,	45	20	...	40	...	66 0 0	35 0 0	31 0 0	...

"Statement No. 6 appended shows the returns from the thin seeding experiment for the last three years, from which it will be seen that the results have always been the same; the thin seeded plots, according to the quantity of seed sown, giving the greatest outturn. Even with such a bad dry season as we have just gone through, when it could hardly have been expected that there was sufficient moisture in the soil to cause the plants to tiller properly, the results have been the same, although not to such a degree as in good seasons. No. 1 plot, which was sown with 20 seers of seed per acre, gives an outturn of only 10 maunds 19 seers per acre ; but, as already explained in para. 3 of this report, a part of the plot being on high ground it got dry and did not germinate ; otherwise, from the part of the plot measured which did germinate the outturn should have been above 21 maunds per acre ; all the other plots gives about the same outturn, a little over 17 maunds per acre.

"The statement, I think, bears out the superiority of the thin seeding system. Even if there is very little difference in the outturn, still there would have been a saving of from 20 to 25 seers seed per acre ; and when we come to consider the very trying season, when it was thought there was hardly sufficient moisture in the ground to grow any sort of crop, it will be admitted that the system has passed a very severe test. In ordinary seasons, *i. e.*, during the last three seasons, besides the saving of the seed, there was an average increase of 3 maunds per acre on the thin seeded plot over the ordinary seeded plot.

"Statement No. 2 shows that the outturn from the wheat plots points to the same conclusion. No. 1 plot, sown with 23 seers of seed, gives the second greatest outturn, but the outturn from the others are irregular ; the crop was attacked by rust and was worse in some places than others : hence we cannot make any just estimate of what the crop would have been had it not been attacked by the rust. Nevertheless there is the smallest loss on plot No. 1."

22. No other points of interest are brought out on the experimental area, and I now proceed to give an abstract of operations on the municipal sewage farm, the origin of which was explained in para 14, &c., of last year's report, to which I beg leave to refer.

23. Sewage is divided under two heads—latrine manure and dry street sweepings. The system adopted under the first head is that the municipality send all their latrine manure in carts to land placed under Mr. Phillips' superintendence. Mr. Phillips' duties consist in having trenches dug for the reception of the manure and in putting the manured land under cultivation until fit for letting out to cultivators.

24. One main feature in the trench system adopted at Allahabad is the shallowness of the trenches. The following extract is taken from Mr. Phillips' report :—

"The principle of the new system consists in the night-soil being put into much shallower trenches and being mixed up with soil (while the carts are being emptied) into a sufficiently thick consistency, so that when covering the trenches the night-soil does not overflow in the trench, and therefore can be properly and securely covered. The trenches are made 8 feet long, 3 feet wide, and only 15 inches deep, leaving from 4 to 6 inches of a wall between each trench ; two carts of manure are put into each trench, each cart of which contains about 50 gallons, so that 100 gallons are put into each trench ; and as it requires about 1,203 trenches to cover an acre of land, the amount of manure required for each acre is about 120,300 gallons. Great care is taken immediately the carts are emptied to mix with soil and cover up the manure ; by this means the flies are kept away, and it has been proved that by mixing the manure with soil it deodorizes so quickly that a rabi crop can be sown one month after trenching A piece of ground which was trenched last September was sown with barley in October, and gave a greater outturn than any of the rest of the land which was cropped."

25 The following is a statement which I have obtained, showing the cost to the municipality for carting and trenching per acre :—

Number.	Name of place.	Number of carts used.	Number of bullocks.	Number of men.	Number of daily trips.	Number of monthly trips.	Quantity of manure by each cart in each trip.	Area manured per month.	Charges to the Municipality.				Number of cartloads per acre.	Weight per acre.	Cost per acre to the Municipality.			
									Cartage.	Loading.	Trenching.	Total.			Cartage.	Loading.	Trenching.	Total.
1.	2.	3.	4	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.
								A. r. p	Rs. a. p	Rs a. p	Rs. a. p.	Rs. a. p.			Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
1	Civil Station ...	53	53	83	66	1,980	4·464 cwt. or 8·229 cubic feet.	1 0 0	146 9 0	76 0 0	45 0 0	667 9 0	1,980	8,839·285 cwt. or 15,885·489 cubic feet.	546 9 0	76 0 0	45 0 0	667 9 0
2	City ...	40	40	62	100	3,000	4·464 cwt. or 8·229 cubic feet.	1 1 0	412 0 0	...	97 0 0	509 0 0	2,500	1,116·714 cwt. or 200,574·594 cubic feet.	330 10 5	...	77 9 7	408 4 0

In reading the above statistics it must be borne in mind that the farm has nothing to do with charges for cartage. Latrine filth has to be carried out, and the problem to be solved is whether, having been carried out, it will give better returns and with better sanitary results under agriculture than any other system of disposal. It will be observed that trenching forms a very small percentage of the expenditure.

26. The next two statements show the cost of bringing trenched land under cultivation in the first year :—

Year.	Area.	*Receipts.*			*Charges.*		
		Value of crop.	Rent.	Total.	Rent.	Cost of cultivation and preparation of land before leasing.	Total.
1.	2.	3.	4.	5.	6.	7.	8.
	A. r. p.	Rs. a. p.		Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
1877-78	34 1 0	351 2 0	...	351 2 0	486 14 0	651 8 2	1,138 6 2

Cost of trenching one acre of land.

Year.	Value of crop grown per acre.	Rent.	Cost of cultivation and preparation.	Total.	Profit.	Loss.
1.	9.	10.	11.	12.	13.	14.
	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.		Rs. a. p.
1877-78	10 4 0	14 3 5	19 0 4	33 3 9	...	22 15 9

The above statement shows (in round numbers) a loss of Rs. 23 an acre, of which Rs. 14 an acre went to rent, *i. e.*, there was a net loss of Rs. 9 an acre. But the year was so exceptional that I think Mr. Phillips' promise to recover expenditure in future years may be accepted, especially as in the previous year 1876-77 expenditure was recouped.

27. The most important point is to discover the increased value of the manured land, for the ascertainment of which we can only apply the rental test. I am glad to report that each year an improvement is being effected in rental receipts, as the value of the manure becomes better known.

The following table will show how the scale is rising each year :—

The orginal rent of land taken up was from Rs. 15 to Rs. 20 an acre, averaging Rs. 17-8-0.

A small area manured let in 1875-76 for Rs. 25-4-0 per acre.

In 1876-77, 46 acres let, on a 3 years' lease, for Rs. 1,198, or Rs. 26 per acre.

In 1877-78, 58 acres let, on a 3 years' lease, for Rs. 1,827, or Rs. 31-8 per acre.

In 1878-79, 34 acres let, on a 5 years' lease, for Rs. 1,245, or Rs. 36-10 per acre.

[The maximum rent in the last year being Rs. 42 per acre]. An increase has therefore been made on the original rent of about Rs. 22 per acre.

28. It is important to know how much land is capable of being trenched each month, whether from a given number of carts or from a given population, although in the latter case it must be satisfactorily ascertained that all or nearly all the manure of the whole population is brought to the field. This is a point for municipal authorities to investigate, and I shall be glad of the assistance of the Allahabad Municipality in obtaining the information. I can only deal with the proportion of carts to land.

29. The statement of para. 25 shows that 2,500 cartloads of the city manure and 1,980 of the civil station manure were sufficient for one acre. The Superintendent was asked to give the contents of each cart, but his statement is not clear, and I cannot give the exact cubic proportions in the present report ; an approximate weight is recorded. The Allahabad cart, made by Mr. Crowley of that city, is, however, known to many municipalities, and it will give them some information to be told the number of cartloads per acre. The difference between the city and civil station average will have to be explained in a future report, but since as a rule carts are not full, it will probably be found that city carts are less full than civil station carts.

30. The concentration of manure will be best understood when I state that 100 cartloads of about the same size would be considered a very heavy manuring by a native cultivator. This fact shows the probability of Mr. Phillips' idea being true, that the effect of the manure will last at least 10 years.

31. If I am right in my conjecture that much of the manure of the city is not sent to the field, a larger area ought to be brought gradually under manure. As the figures stand, we may assume, in round numbers, that a population of 100,000 people (excluding about one-fifth) supply manure for 25 acres a year, which give for 10 years an enhanced rent of Rs. 20 an acre, or an income of Rs. 5,000 a year. If water is available, the income might probably be raised to Rs. 7,000 or Rs. 8,000 a year.

32. But this income might be very largely enhanced if land could be obtained permanently by the committee instead of being hired, as at Allahabad, on 10 years' leases. For it is a fact that land once manured in the way described by Mr. Phillips never falls back to its original poor condition, and would always be worth a great deal more than the rental price at which it started. A scheme has been under contemplation to adopt a system of tramway carriage which may enable manure to be carried to land which can be permanently acquired, and if so, it will certainly be found worth while to construct irrigating power of some kind which, with manure, will raise rentals to Rs. 50 or 60 an acre, as at Cawnpore. The project has (it is understood) been made over to the District Engineer for estimates, and will be noticed in greater detail in the next half-yearly report.

33. I cannot refrain from noticing here the great advantage which would accrue to municipalities from purchasing permanent rights in land in the immediate vicinity of their towns. Ten years ago I sent up a proposition to Government to purchase land near Cawnpore for the disposal of sewage, but was informed that the object not being "a public purpose," I could not be allowed to appropriate the land under the Land Appropriation Act. If this decision was in accordance with the strict interpretation of the law, which I venture to doubt, I certainly advocate an alteration of the Act, for I know of no method in which municipalities can more advantageously increase their income than by the creation of a ring of highly cultivated farm round their cities, of which the continually increasing value due to inevitable progress will, in the course of time, supply them with an income of which the collection can be made with perfect ease, and which will go far to render them independent of taxes. The policy of buying city land is a wise one for municipalities to adopt, without reference to the remunerative employment of sewage ; but if it can be shown, as it may be, that town refuse is in this country, where agricultural labour is cheap, a valuable property, it follows that a municipality must possess themselves of land on which to use it. Every year makes city land more valuable, and I strongly advise municipalities to raise loans for the purchase of as much land in the vicinity of their towns as they can buy at a reasonable price.

34. The argument is strengthened by the statistics which have been obtained for land treated with deep ploughing and city sweepings. About 100 acres of confiscated land thus prepared have been let out for two and three years, and it was contemplated to establish 400 acres under this system, of which 100 should be annually

rented for a three years' term, but the project is hampered by difficulty in obtaining land free from objection on sanitary grounds. The land which has been lately occupied is very poor, and rents have been raised from something under Rs. 10 to something over Rs. 20, sometimes over Rs. 30, an advance which would give a net income of Rs. 3,000 to Rs. 5,000 a year could 300 acres of land be obtained.

35. The following is the description given by Mr. Phillips of the method employed in utilizing city sweepings :—

"The results show that, paying for all manure at the rate for which it was sold in the bazar for burning bricks, &c., and all other working expenditure on the land, it has more than paid itself up to date, showing a balance of Rs. 555-0-10, and the permanent improvements as a total profit on the 10 acres of land for 6 years thus :—

	Rs.	a.	p.
Profit on crop for 3 years	555	0	10
Rent received for 10 acres of land for 3 years at Rs. 36-12-0 per acre	1,102	8	0
Total profit ...	1,657	8	10

or a profit of Rs. 29-2-2 per annum per acre.

"At Chikatpur, which is situated near the Race-course, 50 acres of land were taken up for the station sweepings, and at Karailabagh about 50 acres for the city sweepings, as part of the system for the utilization of bazar sweepings sketched out in last year's report. 400 acres of land is required altogether, 100 to be taken up each year for four years to make a rotation. In four years 300 acres would be rented out, while the fourth hundred would be in hand for preparing and cropping. When this was rented out, the 100 acres rented out the first year would revert back to be re-manured and cropped, and the following year it would be rented out, the next 100 acres reverting, and so on."

36. The instance given by Mr. Phillips is somewhat exceptional, for, as a rule, the land manured with sweepings does not let for more than Rs. 25 or Rs. 30 an acre. The figures, however, represent actual facts, and indicate the possibility of obtaining a higher average, especially now that every year brings an advance in the rent offered.

37. The following table shows the financial results which Mr. Phillips believes to have been already obtained:—

Estimate of Receipts and Charges on the Municipal Sewage Farm at Allahabad, showing results obtained up to 31*st May*, 1878.

Receipts by Municipality.	Amount.			Charges against Municipality.	Amount.		
	Rs.	a.	p		Rs.	a.	p
To rent of 46½ acres of farm land made over to the municipality for two years	2,397	2	0	By revenue of 46½ acres of farm land for two years	836	0	0
To rent of 58 acres of land made over to the municipality for three years...	5,485	5	0	By revenue of 58 acres of farm land for three years	1,566	0	0
To rent of 50 acres of land at Chikatpur rented out in 1877-78 for three years	1,776	3	0	By rent of 50 acres of land at Chikatpur for four years	927	12	0
To produce of the above 50 acres of land cultivated before leasing ...	340	8	6	By cost of cultivating the above 50 acres of land	339	12	9
To rent of 34¼ acres of land trenched at Karailabagh and Baghara, rented out in 1877-78 for five years ...	6,227	8	0	By rent of 34¼ acres of land trenched at Karailabagh and Baghara for six years	2,921	4	0
To produce of the above 34¼ acres of land cultivated before leasing ...	351	2	0	By cost of cultivating the above 34¼ acres of land	651	8	2
To produce of 30¼ acres of land not yet trenched	392	0	0	By rent of 30¼ acres of land ...	435	7	3
				By cost of cultivating the above 30¼ acres of land	80	0	0
				By balance net profit to the municipality	9,261	11	4
Total ...	16,969	7	6	Total ...	16,969	7	6

38. The above statement must, however, be subjected to modification. The facts are really as Mr. Phillips gives them, but he has omitted to explain that the land of the two plots of 46½ and 58 acres are free of rent charge; that the natural

charge on such land, if it did not happen to be confiscated land, would be about double the revenue (which was assessed on the prevailing rate of the neighbourhood); and that an additional charge of about Rs. 2,400 ought thus to be included, reducing the net profit to a little less than Rs. 7,000.

39. My own deduction from facts already adduced is that, if it be incumbent on a municipality to carry solid manure outside the town, they can in that case use it most profitably in agricultural work; that the Allahabad statistics, if taken as a guide, indicate that a net income of Rs. 10,000 a year may be thus obtained, and (if I am right in supposing that much of the manure is not taken to the land) of a larger amount; that if they are able to purchase the land thus manured their annual income will continually increase by that natural process of enhancement which has enriched many school and town corporations in England. The net income will go some way towards paying for the removal of the manure from the North-Western Provinces if it will not pay for it all.

40. The above calculations are based on returns from unirrigated land. On irrigated lands the returns are much higher. I raised rents in Cawnpore from Rs. 15 an acre to Rs. 60 an acre with the help of manure plus canal water, and the municipality has since let other land for even higher rates and has now an enhanced income of (I believe) about Rs. 4,000 on 100 acres of land. If my proposition to buy land had been accepted 10 years ago, they would probably have had by this time an enhanced income of double the amount, since quite one-half of their carted latrine manure has had to be irrecoverably buried under brick-kilns. Now I fear that adjacent land has followed the fate of the Sybilline books, and that half the area will cost double the price for which it could have been obtained 10 years ago, and that the municipality have consequently lost whatever accretion of value has ensued.

41. Manuscript statements are filed with the report, which show the result of agricultural operations for the year, as well as purely financial results, and which the following remarks will tend to explain. Taking the agricultural year to be the 12 months from June 1st, 1877 to May 31st, 1878—

Receipts were	Amount.	Expenditure was	Amount.	Remarks.
	Rs. a. p		Rs. a. p.	
Value of previous seasons' crops sold or used in 1877-78 ...	1,328 13 4	On agricultural operations, exclusive of rent, cash ...	993 13 8	
		Value of produce used as fodder, &c. ...	424 2 0	(Crop of 1876-77).
Value of 1877-78 crop sold or used in 1877-78 ...	868 13 3	Ditto ditto ...	158 4 7	(Do. of 1877-78).
Value of crop still in hand,	1,092 10 1			
Total ...	3,290 4 8	Total ..	1,576 4 3	

The results of the year are therefore due, to some extent, to the larger stocks in hand of last year's crop, and the failure of this year will tell on the receipts of next year, since the value of crop in hand on June 1st, 1878 is smaller than it was in the previous year on the same date. The profit on the agricultural operations, exclusive of rent, was Rs. 1,714-0-5, the area being 48 acres.

42. A second statement is given (in MS.) showing similar statistics for the financial year, but as the financial year closes before the harvest of rabi crops, this is not so good a guide to the results of the year as those of the preceding paragraph, and is only filed in order to show the agreement of agricultural accounts with other financial statements.

43. I have endeavoured, by stringent instructions on the subject, to make the Allahabad experimental farm, not including the sewage farm, pay its own expenses (except the pay of Superintendent), reserving the grant for expenditure on objects separately reported to Government. Practically I have, with Mr. Phillips' assistance, succeeded in

doing so. The grant is Rs. 4,000, expenditure has been Rs. 3,354, and receipts Rs. 3,281, which, in consideration of the severe drought, is a sufficiently satisfactory result. The sewage farm receipts are made over to the municipality, who defray expenses. Up to March 31st Rs. 1,282 was the net profit accruing to the municipality, of which Rs. 481-15-0 was expended on planting orchards in their behalf. Rs. 3,469-0-8 were the receipts and Rs. 2,187-0-8 the outgoings, leaving the balance of Rs. 1,282 above quoted.

CAWNPORE FARM.

44. Progress was terribly interrupted by the drought, only 5 inches of rain having fallen up to the end of September. Mr. Unsworth was in charge during the year, but, having been offered a more lucrative appointment as manager of a private property, tendered his resignation, which, under the contract made with him, entitled to tender with six months' notice. Had Mr. Unsworth been a younger man, I should have recommended Government to retain his services by the offer of a higher salary, for Mr. Unsworth was a very careful and experienced agriculturist, having received a practical education as an indigo-planter; but as he had already reached the age at which Government rules ordinarily require resignation of appointment, I thought it better that a younger man should come in and learn the work, and accepted his resignation without demur. The choice of a successor devolved upon Mr. Wright, who had charge during my leave to England, and who temporarily appointed, in June last, Mr. W. H. Smith, who had had some experience on indigo plantations.

45. Following the division adopted in last year's report, I divide the work under three heads :—

Fruit garden.
Flower garden.
Farm.

In my 31st paragraph of last year's report I suggested the elimination of the floral element from the establishment at Cawnpore, in order to avoid the temptation of placing a floriculturist, rather than an agriculturist, in charge. Experience of some years shows, too, that to any official in charge culture and sale of flowers often afford more interest than the slower and duller processes connected with agricultural experiments, specially as in the one case he has the zest of improving the income of the farm, which he can seldom expect to manage in the agricultural section. But I have always deprecated the notion that we are endeavouring to make a model, *i.e.*, a profitable, farm at Cawnpore. We will attempt to do so on a Court of Wards' estate, if Government wish, and work there for profit. But at Cawnpore we must be at liberty to try experiments, profitable or unprofitable, and any income made by sale of flowers involves a great deal of attention on the part of the Superintendent which he could better devote to agricultural work. Gardening therefore, as regards floriculture proper, is now excluded from Cawnpore and transferred entirely to Lucknow, where there is a trained floriculturist in charge of the Government garden.

46. In the place of floriculture, however, another branch of useful work has risen which requires less special training and less interruption to agricultural duties—I allude to arboriculture. The Cawnpore farm has, indeed, always supplied to the public young fruit trees and saplings, but has not until this year been raised to the position of a nursery for provincial purposes. The new heading of nurseries will, therefore, be introduced in substitution of that of flower gardens, which after this report will disappear from the Cawnpore returns.

47. It became requisite during the past year for Government to intimate to me the necessity of removing my head office from Allahabad, and Lucknow was suggested for its location. But I strongly urged the desirability of taking the opportunity to give the officer in charge of this department an office at the farm; not at Cawnpore itself, which is four miles from the farm, but in the immediate vicinity of the farm lands

in the suburb of Goteya. It so happened that just at the time the Society for the Propagation of the Gospel were proposing to transfer their orphanage schools from Goteya to Cawnpore, and, after some correspondence on the subject, Government permitted me to purchase their buildings and obtain a perpetual lease of the land upon which they stand.

48. The area of the farm lands (exclusive of fields rented from adjacent villages) now consists of acres 54-0-11, and has received from the orphanage an accession of acres 60-3-0 at a rent of Rs. 295. The buildings are the following :—

(1.) Bungalow.
(2.) Ditto for office.
(3.) Seed godowns.
(4.) Two clerks' houses.

They were valued as they stood at Rs. 12,000 by a Cawnpore Engineer, and were obtained for Rs. 4,000, which was about the price of the materials ; but another Rs. 1,000 will have to be spent upon repairs—a total sum which involves, at 5 per cent., an annual outlay of Rs. 250 a year. The expenditure was met from the savings at Allahabad and Cawnpore.

49. The land obtained is, much of it, of a very poor and raviny character, but not at all ill-adapted to the formation of nurseries of trees which are destined for similar land ; and I am assured that if arboricultural extension is to make any progress outside road avenues, it is only such land that can be secured for the purpose, since better soil must always be retained for crops. Canal irrigation will be available, and the land will be of great value to us for cattle-grazing as well as for arboriculture and field experiments.

50. The principal advantage derived from the establishment of the new premises on the farm is the better chance which is given to the officer in charge of this department of learning the farm work and of watching and supervising operations upon it. For, as I represented to Government, the drive to and from Cawnpore in the hot weather narrowed supervision to very small limits, since it was then impossible to stay on the farm without a roof overhead after the early hours of the morning. The transfer from Allahabad to the new buildings at Cawnpore could not be made till August, 1878, as the orphanage authorities were not prepared till then to vacate them, but final arrangements were concluded before the termination of the year under report.

51. I will now revert to the review of the operations of the year under the charge of the Superintendent, and I am saved the necessity which devolved upon me last year of re-casting the Superintendent's report, since it is on this occasion drawn up in a sufficiently concise and systematic form, and is for this reason printed *in extenso* as appendix I. to this report.

52. The farm consists (excluding the orphanage lands not taken over before the end of the year under report) of two sections—(1) land the property of Government, (2) land taken on lease from adjacent villages.

(1) *Government land.*—The areas are—

	Acres	Roods.	Poles.
Under trees	32	1	14
„ crops	3	3	26
Roads and buildings	8	1	38
Tank	4	1	13
Total ...	54	0	11
Leased	116	2	24
	170	2	35

6 acres 2 roods 22 poles of the leased land belongs to the municipal farm on the other side of the city, and were taken for experimental wheat cultivation.

53. *Fruit Garden.*—The following table shows the number of fruit trees and the area they occupy in the gardens, with comparative results for three years :—

Statement showing Results of cultivation of Fruit trees on the Government Farm, Cawnpore.

Number of trees.	Names of fruit trees	Year.	Area.	Gross price realized.	Cost of cultivation.	Net return.	Return per acre. Gross.	Return per acre. Net.	Return per tree. Gross.	Return per tree. Net.
			A. r. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
332	Mangoes	1875-76,	6 0 36	355 0 0	28 0 0	327 0 0	57 0 5	52 8 5	1 1 1	0 15 9
		1876-77,		1,100 0 0	27 14 9	1,072 1 3	176 11 4	172 3 6	3 5 0	3 3 7
		1877-78,		818 2 8	64 9 10	753 8 5	131 6 9	121 0 9	2 7 5	2 4 8
151	Peaches,	1875-76,	1 0 28	37 0 0	16 0 0	21 0 0	31 7 9	17 13 11	0 3 11	0 2 2
		1876-77,		36 15 8	15 12 6	21 3 2	31 7 8	18 0 6	0 3 11	0 2 3
		1877-78,		40 7 6	22 6 10	18 0 8	34 7 0	15 5 8	0 4 3	0 1 10
79	Figs ...	1875-76,	0 2 19	12 0 0	5 0 0	7 0 0	19 6 3	11 5 0	0 2 5	0 1 5
		1876-77,		10 0 0	4 3 3	5 12 9	16 2 7	9 6 0	0 2 0	0 1 2
		1877-78,		18 0 0	17 15 10	0 0 2	29 1 5	...	0 3 7	0 0 0
292	Oranges,	1875-76,	2 1 19	100 0 0	12 0 0	88 0 0	42 3 5	37 2 4	0 5 5	0 4 9
		1876-77,		80 0 0	14 2 0	65 14 0	33 12 4	27 12 11	0 4 5	0 3 7
		1877-78,		100 0 0	36 10 2	63 5 10	42 3 5	26 12 0	0 5 5	0 3 5
151	Custard-apples.	1875-76,	0 3 32	73 0 0	3 0 0	70 0 0	76 13 5	73 11 0	0 7 8	0 7 4
		1876-77,		60 0 0	3 7 0	56 9 0	63 2 6	59 8 7	0 6 4	0 6 0
		1877-78,		...	19 15 6	...	...	...	...	...
102	Grapes,	1875-76,	0 2 18	89 0 0	36 1 0	52 15 0	153 1 10	91 1 4	0 14 0	0 8 3
		1876-77,		287 7 11	37 5 0	250 2 11	494 9 10	430 8 8	2 13 1	2 7 2
		1877-78,		188 0 0	64 15 8	123 0 4	323 7 0	211 10 4	1 13 6	1 3 3
54	Guavas,	1875-76,	0 1 33	30 0 0	1 8 0	28 8 0	65 12 0	62 7 5	0 8 10	0 8 5
		1876-77,		24 0 0	1 5 3	22 10 9	52 9 7	49 11 0	0 7 1	0 6 8
		1877-78,		10 0 0	2 2 6	7 13 6	21 14 8	17 3 0	0 2 11	0 2 4
67	Limes ...	1875-76,	0 3 16	29 0 0	2 7 0	26 9 0	34 1 10	31 4 0	0 6 11	0 6 4
		1876-77,		20 0 0	2 7 0	17 9 0	23 8 5	20 10 7	0 4 2	0 4 2
		1877-78,		16 0 0	9 6 0	6 10 0	18 13 2	7 12 8	0 3 9	0 1 7
5	Jack-fruit.	1875-76,	0 1 0	67 0 0	2 0 0	65 0 0	268 0 0	260 0 0	13 6 5	13 0 0
6		1876-77,		100 0 0	1 1 0	98 15 0	400 0 0	395 12 0	20 0 0	19 12 7
		1877-78,		36 0 0	2 12 0	33 4 0	144 0 0	133 0 0	6 0 0	5 8 8
	Straw-berry.	1875-76,	0 0 20	34 12 0	10 5 0	24 7 0	278 0 0	195 8 0	...	...
		1876-77,	0 1 0	105 2 0	14 8 6	90 9 6	420 8 0	362 6 0	...	...
		1877-78,		...	...	...	...	...	...	...

54. I advised last year that municipalities should be invited to establish gardens of fruit trees as a profitable investment, basing my advice on the results obtained at Cawnpore, which indicated that outlay on fruit gardens would be remunerative, and, with the consent of Government, a circular was addressed to municipalities. Very little, however, could be done, either by municipalities or by the garden establishment, in raising plantations on account of the drought and exceptional expenditure on objects more or less connected with the famine. The following municipalities have shown themselves willing to improve their stock of fruits trees :—

Sultanpur.	Bahraich.
Gházipur.	Meerut.
Saháranpur.	Bareilly.
Patabgarh.	Basti.
Lalitpur.	

55. The fruits that succeeded best were again grapes, jack-fruits, and mangoes. The season proved very unfavourable for strawberries. The results show the value of mangoes in a year of which the rains are unfavourable, since the crop turned out well notwithstanding the drought.

56. I impressed strongly upon the Superintendent the necessity of making Cawnpore an active centre of distribution for fruit trees, and he did his best. But the season, of course, did much to defeat his efforts. A table will be found in his report of the numbers of grafts and seedlings which were raised. Extensions are also being made in the area of mango groves in and in the vicinity of the gardens in order to increase facilities for raising plants, the number of which is limited by the number of parent trees.

57. *Flower Garden.*—The table given by Mr. Unsworth shows what a profitable item is the sale of roses, which realized Rs. 858, and I am not surprised that the Cawnpore manager is unwilling to part with them ; but Government will hardly lose, as sales will practically be transferred to Lucknow, to which all plants of every description which are worth having are transferred.

58. The only business now permitted at Cawnpore which might come under the head of flower garden is the establishment of nurseries of flowering trees, shrubs, and creepers, for distribution to railway stations and public roads. Mr. Unsworth has not mentioned what has been done in this way, but as the dry weather prevented the extension of operations, a description of actual operations may be deferred to future reports. The objects which I have had in view are to raise a very large stock of a few of the most popular ornamental shrubs and creepers which do well enough in the North-West climate, to make their culture and propagation a matter of no practical difficulty. Their distribution is to be more of a public than of a private character, and I am in correspondence with the Railway Companies to supply them with such plants for their stations in return for free carriage of plants and agricultural implements to and from the gardens. The East Indian Railway Company have consented to the plantation with trees, shrubs, and creepers of one of their stations (Bhaupur) near Cawnpore, as an experiment. I also have suggested to some municipalities the desirability of disposing of road sweepings in excavations at vacant spaces on roadsides which can be utilized as beds for ornamental trees and shrubs, of which we offer to raise a stock for them at Cawnpore. A commencement was made at Agra, which was, like so many other projects, cut short by the drought. I ought to add that the principal reason why this branch of horticultural—though it might almost be called arboricultural—work is not confined to Lucknow is on account of the facility given at Cawnpore by canal water for the cheap maintenance of plantations.

59. *Farm.*—The drought was severely felt at Cawnpore, where the climate is, perhaps, in ordinary years, the driest in the North-West Provinces.

The following table gives the area under each crop during the year :—

Kharif.	Area.	Rabi.	Area.
	A. r. p.		A. r. p.
1. Joar	14 0 37	1. Wheat	15 0 20
2. Sorgho...	3 0 16	2. Barley	5 2 11
3. Maize	4 0 31	3. Barley and gram... ...	6 2 38
4. Indigo	3 1 4	4 Gram	10 2 39
5. Potatoes	1 3 27	5. Peas	7 3 14
6. Sugarcane	2 0 0	6. Oats	4 0 31
7. Cotton..	2 0 0	7. Australian wheat... ...	0 2 3
		8. English barley	0 2 4
		9. Bákla beans	0 3 21
		10. Lucerne	0 1 32
		11. Mixed wheat	1 0 0
Total ...	30 2 35	Total ...	53 2 13

60. A danger to which in this country comparative experiments are always liable, and which must, I fear, always throw a great deal of discredit on experimental trials,

was greatly enhanced in 1877-78 by the scarcity of food giving temptations to constant thefts of grain on threshing-floor, which, although detected by Mr. Unsworth, made his results still more untrustworthy than the failure of the season had already rendered them.

61. The most important comparative experiments were those between English and Native ploughing. The following table shows the percentage of increase in six crops under the English plough. The outturns were poor owing to the prevalence of blight:—

Name of crop.	Area.	*Outturn in maunds.*		Percentage of increase due to English plough.
		English plough.	Native plough.	
	A. r. p.	Mds. s. c.	Mds s. c.	
Pedigree wheat	1 0 1	38 1 0	26 9 0	47
Country do.	5 2 9	305 9 0	269 34 0	13
Barley	2 1 5	88 26 0	80 29 0	10
Barley and gram	3 1 19	63 14 0	54 39 0	15
Gram	4 1 2	49 5 0	40 0 0	22
Oats	1 2 4	89 10 0	83 26 0	7

62. The outturn of wheat under poudrette was, per acre, 54 maunds against 42 with ordinary manure, showing an increase of 30 per cent. These results are valuable, firstly, as indicating the influence of poudrette; secondly, as showing what a maximum outturn of wheat can be. 54 maunds is equivalent to nearly 70 bushels, a figure which goes some way to explain the high rents which are beginning to follow the use of poudrette at Cawnpore and Allahabad.

63. Wheat, on account of the importance of the rising trade, was to have been adopted as the principal staple of experiments, and I was supplied with seed from England and from Jabalpur and Dehli (which send the most popular grain to the home market). But the season caused a complete failure, and the Jabalpur seed did not equal indigenous grain either in quantity or quality.

64. The history of other crops tried on the farm is sufficiently described in Mr. Unsworth's report. The outturns were so much affected by the adverse season that experimental results, other than those already given, are not worth criticising.

65. *Subsoil drainage.*—An experiment which ought to have been interesting was tried under the advice and with the assistance of Colonel Thomason, R.E., who supplied the pipes and superintended their arrangement in a plot of land adjacent to the farm, with the view of proving the effect of subsoil drainage. In my own opinion the character of the land chosen is too dry and will not give any substantial results to drainage, which is, of course, chiefly wanted in heavy wet lands. But Colonel Thomason is convinced that, even on light soil, drains will change the character of the land, and I have allowed a most thorough experiment to be instituted: every system of cultivation and of crop is being tried on drained land and compared with results on undrained land, a trial which does not prevent other comparative experiments being conducted at the same time on both classes of land. For instance, both English and Native ploughs are used on the drained land and on the undrained land, and two sets of results are thereby obtained for comparison between the English and Native plough. The manner in which the land

has been laid out under drains has been imperfectly described by Mr. Unsworth, but will be more succinctly treated in a future report.

66. During the year I instituted the first of what I hope will be a long continued series of experiments with water-lifts. When in Australia three years ago I saw a simple "water-lift" at the Melbourne Exhibition and ordered out a small one, which, on arrival in India, was tried for a year on the Gházipur Tobacco Farm, and proved so useful that I brought it to Cawnpore for scientific experiment. Measuring tanks (built in connection with the subsoil drainage system) were used for determining the comparative work done by the lifts and by the method adopted of raising water in baskets from canals. It was proved that two men at the pump could do the work of four with baskets, but then the cost of the pump is over Rs. 100, whereas the cost of a basket is only just over one rupee; the price, however, can probably be materially reduced. The Superintendent of Roorkee Workshops has during the year been engaged in providing for the farm a set of water-lifts of different kinds, which will shortly be set up at Cawnpore and experimentally tested against each other and against existing methods of irrigation.

67. The sugar mill, tested last year by Mr. Unsworth, has been, as described in a separate report, tried in various parts of the province. Mr. Unsworth's experiment at the end of the cold weather of 1877 was, on account of the late arrival of the first mill, made so late (in fact with the very last field of sugarcane standing in the neighbourhood) that I had no opportunity of testing it personally until the cold weather of 1877-78, when it was ascertained, both by my own trial and those of others, that Mr. Unsworth's figures of 1877 were very extravagant. At the same time the new mill gave better results, on the whole, with much less labour than the ordinary native apparatus, and it is, as in the case of the pump, only the initial cost which will interfere with its popularity. Measures have been taken, with the consent of Government, to offer it to the cultivating public on a system of annual payments by instalments. The most important feature in the new mill is the fact that it produces a better sugar—a fact of great value in the case of competition in foreign markets.

68. We promised to do a great deal in the trial of English ploughs on Court of Wards' estates. But when the drought came it was worse than useless to trouble either local authorities or cultivators with any instructions on the subject, and I decided to postpone any active steps until the present year, which will be described in the reports on this year's operations. It is enough to say that so far the B. F. O. plough has at present proved the most effective, and that some district officers have taken sufficient interest in the trial to give promise of satisfactory experiment, although others have shown equal insouciance. I shall, however, never cease to advise Government that the best way to attempt the active improvement of native systems of agriculture will be to place an officer of intelligence and special inclination for the task in charge of a Court of Wards' estate. To return to ploughs, I have received some hopeful indication that natives will gradually take to deeper ploughing, and I can assure Government that no efforts will be spared on my part to make the most of my opportunities to induce them to do so, believing as I do that deep ploughing will extract from the soil an enormous amount of now buried agricultural wealth. I have induced natives to use the English plough on the municipal farm at Cawnpore, and they now continue to do so of their own accord. It has also been introduced generally on the tobacco farm at Gházipur. Trained men are now sent out to teach the use of it on Court of Wards' estates, and ploughs are given out without payment for trial to zamindars. Correspondence is being carried on with Messrs. Ransom and Sims for the construction of modified ploughs, a native plough having been sent to that firm for inspection. The Madras modified plough has been tried, but does not succeed so well in the North-Western Provinces as the B. F. O., although it can be made at a cheaper cost. I append to this report the supplementary note by Mr. Phillips on ploughs which was promised in my para. 13 of last year's report. Improved ploughs are also being made at Cawnpore.

69. The following table shows the financial results of the two farms during the year under report (1877-78):—

Receipts.	Amount.	Expenditure.	Amount.
	Rs. a. p.		Rs. a. p.
By Imperial grant for salaries of Superintendents. ...	9,000 0 0	To salaries of Superintendents ...	7,800 0 0
„ Provincial grant for two farms at Rs. 4,000 each. ...	8,000 0 0	Operations, two Farms ...	10,128 5 0
„ sale of farm produce ...	8,998 13 2	EXTRA EXPENDITURE.	
		Purchase of Orphanage lands and buildings at Cawnpore ...	4,000 0 0
		Construction of wells ...	500 0 0
		Construction of cattle-sheds ...	500 0 0
		Carriage of agricultural machinery from Roorkee ...	250 0 0
		Purchase of cattle for breeding purposes ...	500 0 0
		Purchase of Australian rams ...	500 0 0
		Purchase of seed for distribution ...	279 4 2
		Sinking wells ...	500 0 0
Total Receipts ...	25,998 13 2	Total Expenditure ...	24,957 9 2
		Saving	1,041 4 0

I have the honour to be,

SIR,

Your most obedient servant,

E. C. BUCK,

Director, Dept. of Agri. and Commerce,

N.-W. P. and Oudh.

APPENDIX I.

Report by Superintendent, Government Farm, Cawnpore.

I HAVE the honour to submit the following report on the operations of the Cawnpore Farm for the year 1877-78.

2. The year has been one of disaster to the operations of the farm; at its commencement we had cloudy and foggy weather accompanied by an east wind, which, coming as it did when fruit trees were in blossom, very materially reduced the yield. We had drizzling cloudy weather during the months of April and May; subsequently a long period of drought with occasional falls of rain. The subjoined table will show the quantity and the dates on which it fell :—

Months and wet days.	Inches.
April	...
May	...
June 4th to 27th	·4
July 3rd	1·1
August 3rd, 4th, and 29th	3·5
September 1st	·6
October 7th, 8th, and 9th	3·6
November	...
December 10th and 26th	2·6
January 14th, 26th, and 28th	3·2
February 11th and 12th	·4
March	...
Total rainfall	15·4

3. From the above it will be seen that the rainfall from June to October was little over 9 inches, and but for the timely fall in October the season would have been disastrous; indeed, the weather continued unseasonably hot until the rainfall in December.

4. The area of the farm has been slightly modified from that given in last year's report. A portion of land, acres 29-2-15 in extent, taken for one year only on the western boundary of the Gotaiya village, and situated at an inconvenient distance from the farm, was given up, and other land in a more convenient locality taken up in its stead, consisting of 64 acres.

The following shows the area as it now stands:—

	A.	r.	p.
Government lands.			
Under trees	32	1	14.
„ crops	3	3	26
Roads and buildings	8	1	38
Tank	4	1	13
Total ...	54	0	11
Land leased.			
Third year's lands	35	1	15
Taken up last year	26	2	2
Old farm lands	10	2	27
Ravine lands	37	1	38
Total ...	110	0	2
Total area, Government farm ...	164	0	13
Add area of lands taken up for municipal farm	6	2	22
Total ...	170	2	35

5. There are portions of new lands taken up this year, situated on the ravines, which, although included in the lease, are from their broken nature unfit for cereal cultivation, but will form admirable spots for sowing babúls, planting carobs or other trees of the same nature, and capable of producing a large quantity of useful firewood and some timber. Planting would have been begun had the weather permitted during the season under notice.

Garden.

6. The number of fruit trees in bearing does not differ materially from the number given in my last report.

7. Some few old and unproductive ones have been removed and others put down in their stead.

The following table will show the result of the fruit garden :—

Details of cultivation of fruit trees on the Government Farm, Cawnpore, during the year 1877-78.

Names of fruit trees.	Number of trees.	Area.	Gross price realized.	Cost of cultivation.				Net return.	Return per acre.		Return per tree.	
				Watering.	Manuring.	Miscellaneous.	Total.		Gross.	Net.	Gross.	Net.
		A. r. p	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
1 Mango ...	332	6 0 36	818 2 3	40 0 11	...	24 8 11	64 9 10	753 8 5	131 6 9	121 0 9	2 7 5	2 4 3
2 Peach ...	151	1 0 28	40 7 6	9 0 5	2 0 0	11 6 5	22 6 10	18 0 8	34 7 0	15 5 8	0 4 3	0 1 10
3 Fig ...	79	0 2 19	18 0 0	7 4 7	2 0 0	8 11 3	17 15 10	0 0 2	29 1 5	...	0 3 7	0 0 0
4 Orange ...	292	2 1 19	100 0 0	26 12 8	...	9 13 6	36 10 2	63 5 10	42 3 5	26 12 0	0 5 5	0 3 5
5 Custard-apple	151	0 3 32	...	14 4 4	2 1 0	3 11 2	19 15 6	...	...	...	...	...
6 Grape ...	102	0 2 13	188 0 0	18 6 11	6 12 0	44 12 0	64 15 8	123 0 4	323 7 0	211 10 4	1 13 6	1 3 3
7 Guava ...	54	0 1 33	10 0 0	1 1 6	...	1 1 0	2 2 6	7 13 6	21 14 8	17 3 0	0 2 11	0 2 4
8 Lime ...	67	0 3 16	16 0 0	2 0 0	...	7 6 0	9 6 0	6 10 0	18 13 2	7 12 8	0 3 2	0 1 7
9 Jack ...	6	0 1 0	36 0 0	0 8 0	1 8 0	0 12 0	2 12 0	33 4 0	144 0 0	133 0 0	6 0 0	5 8 8

Fruit Nursery.

8. The work of propagation is shown in the following table :—

Names of trees propagated.	Number of trees grafted.	Number of trees budded.	Number of cuttings.	Number of seedlings.	Remarks.
1 Apple	...	...	14	...	
2 Fig	...	...	170	...	
3 Guava	...	...	...	14	
4 Jack	...	...	...	150	
5 Loquat	78	...	...	...	
6 Pear	...	...	46	...	
7 Plum	...	9	...	...	
8 Pamelo	...	22	...	...	
9 Sour limes	...	...	...	102	
10 Mimusops kauki	...	...	56	...	
11 Mangoes of sorts	440	...	...	1,000	
12 Orange	...	351	...	...	
13 Peach	...	179	...	...	
14 Grape vines	...	...	1,185	...	

9. The following is the quantity of fruit nursery plants disposed of and the amount realized :—

Names of fruit trees.	Number sold.	Amount.	Remarks.
		Rs. a p.	
1 Loquat	16	8 0 0	
2 Orange	220	65 10 0	
3 Peach	9	6 4 0	
4 Mango grafts	181	175 1 0	
5 Vines of sorts	42	35 12 0	

10. Fifty young orange and five loquat trees were obtained from Lucknow and have been planted out in place of other trees removed. Fifty peach trees obtained from Sháhjahánpur have also been planted out; these plants have turned out to be seedlings.

11. *Strawberries.*—This season has been a failure for this fruit. During the long dry season, when rain should have fallen, the whole of the old stock died off. A fresh supply was procured from Saháranpur and Ránikhet, but, although the plants seemed to flourish, they failed to fruit, as we had very unfavourable weather just as the flowers began to appear. The first two flushes were destroyed by foggy weather and damp east wind, then followed four days of sharp frost; the plants after that did no good, and the few fruits that were gathered were poor and tasteless. The total amount realized from this source did not exceed Rs. 5.

12. *Roses.*—The sale of these plants as well as other flowering shrubs has been affected by the dryness of the season. The following table shows the income from this source:—

Name.	Quantity sold.	Amount.	Remarks.
		Rs. a. p.	
Roses of sorts	858	854 10 0	
Shrubs, &c.	96	59 11 2	
Pot plants, &c.	234	102 2 6	
Total	1,188	1,016 7 8	

Nursery.—The following table shows the number of plants propagated :—

Roses of sorts	3,386
Flowering shrubs	1,794
Total	5,180

13. *Arboriculture.*—The extreme dryness rendered the work in this department almost *nil*; seeds of various kinds were received from Saháranpur, but did not germinate. Fifteen hundred carob plants, 675 Mesquit beans, and 30 *terminalia bellericus* were, however, propagated, and are ready for transplanting. Three plots within the garden enclosure have been set aside for future propagation.

Farm.

14. The area under crops this year was as follows :—

A.	r.	p.	
35	1	15	of 3rd year's land.
26	2	2	taken this year.
10	2	27	old farm land.
8	3	26	within the garden.
Total 81	1	30	

The following gives the area of land under each crop :—

Kharif.	Area.	Rabi.	Area.
	A. r. p.		A. r. p.
1. Juár	14 0 37	1. Wheat	15 0 20
2. Sorgho	3 0 16	2. Barley	5 2 11
3. Maize	4 0 31	3. Barley and gram	6 2 38
4. Indigo	3 1 4	4. Gram	10 2 39
5. Potatoes	1 3 27	5. Peas	7 3 14
6. Sugarcane	2 0 0	6. Oats	4 0 31
7. Cotton	2 0 0	7. Australian wheat	0 2 3
		8. English barley	0 2 4
		9. Bakla beans	0 3 21
		10. Lucerne	0 1 32
		11. Mixed wheat	1 0 0
Total	30 2 35	Total	53 2 13

15. Acres 42-0-38 were for experimental cultivation and acres 42-0-10 for produce of seed and fodder. The experiments were carried on in continuation of last year's :—

(1) Comparison between juár and sorgho.
(2) Ditto English ploughing and country ploughing.
(3) Ditto English ploughed and manured and English ploughed, &c., unmanured.
(4) Ditto Country ploughed and manured and country ploughed and unmanured.
(5) Ditto between poudrette and bullock manure.

16. From the unpropitious nature of the season all comparisons have been rendered almost useless ; comparison between juár and sorgho has been continued on the farm last season. It has been unfortunate that since sorgho has been tried on this farm it has not had a season favourable to its growth. I think it requires a damper atmosphere than it has had here since its introduction. Its value as fodder, to judge from the avidity with which the cattle eat it, is superior to juár.

17. Two fields were sown—one on deep and the other on shallow ploughed lands ; every other treatment was exactly the same, and each sown half in sorgho and half in country juár, with following results :—

COMPARISON OF JUAR AND SORGHO.

Name of crop.	English ploughing.						Country ploughing.					
	Area.	Outturn.			Expenditure.		Area.	Outturn.			Expenditure.	
		Grain.	Fodder.	Value.	Cost of ploughing.	Total cost.		Grain.	Fodder.	Value.	Cost of ploughing.	Total cost.
	A. r. p.	M. s. c.	M. s. c	Rs. a. p	Rs a. p	Rs. a. p.	A. r. p.	M. s. c.	M. s. c.	Rs. a. p.	Rs. a. p.	Rs a. p.
Juar	1 0 4	0 21 0	74 19 0	19 8 0	1 0 10	20 14 3	1 0 4	0 34 0	68 22 0	18 14 0	1 7 3	20 14 3
Sorgho	1 0 4	3 12 0	41 31 0	16 12 0	1 0 11	20 14 3	1 0 4	2 17 0	37 11 0	14 0 0	1 7 4	20 14 3

18. The following is a comparison between the English and country plough, manured with 400 maunds of bazar sweepings :—

COMPARISON BETWEEN ENGLISH AND COUNTRY PLOUGHING.

Crop.	English ploughed and manured.						Country ploughed and manured.						Percentage of increase due to English plough.
	Area.	Cost of manuring	Cost of ploughing.	Total cost.	Outturn.	Value.	Area.	Cost of manuring.	Cost of ploughing.	Total cost.	Outturn.	Value.	
	A. r p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	M. s.	Rs. a. p	A. r. p.	Rs. a. p	Rs. a. p.	Rs. a p	M. s.	Rs a. p.	Mds.
Juár ...	1 0 0	5 12 6	1 5 8	16 9 4	102 17	23 5 0	1 0 0	5 12 6	1 5 8	16 9 0	37 10	8 11 0	176

COMPARISON AS ABOVE IN UNMANURED LAND.

Crop.	English ploughed, manured.						Country ploughed, unmanured.						Percentage of increase due to English plough.
	Area.	Cost of manuring	Cost of ploughing.	Total cost.	Outturn.	Value	Area.	Cost of manuring	Cost of ploughing.	Total cost.	Outturn.	Value.	
	A. r. p.		Rs. a p	Rs. a. p.	M. s.	Rs. a. p.	A. r. p.		Rs. a. p.	Rs. a p.	M s.	Rs. a. p	Mds.
Juár ...	1 0 15	..	1 11 6	12 19 4	41 20	10 4 0	1 0 15	.	2 7 2	14 14 10	8 0	2 0 0	428
or per acre	...	..	1 9 1	11 8 0	20	9 2 4	..	..	2 3 9	13 8 4	7 12	1 13 3	

N. B.—The reason why cost of country ploughing is more than English is that the lands under deep cultivation were only ploughed twice, *i.e.*, once with English and the second time with country plough, whereas the lands under shallow cultivation were ploughed three times.

19. Two fields (Nos. 5 and 6) were manured with 300 maunds each of farmyard manure and sown with maize procured from Jaunpur, but for want of rain the experiment failed ; only a few good cobs were secured and kept for seed.

20. *Indigo.*—This crop also suffered from drought, was late in coming to seed, and was damaged by rain in December. The yield was poor and, like all the local samples, was very indifferent. The following table shows the results:—

Crop.	Area.	Mode of ploughing.	Outturn.		Expenditure.
			Seed.	Value.	
	A. r. p.		Mds. s.	Rs. a. p.	Rs. a. p.
Indigo ...	1 2 22	English	5 6	15 0 0	34 5 6
	1 2 22	Country	4 23	14 0 0	30 5 7

21. Wheat of all descriptions, gram, linseed, and peas were so much affected this year by blight that all comparison and experiments have been failures. The wheat crop gave a splendid promise till the 20th February, when rust began to appear and rapidly spread to every field and every variety. Gram and linseed were almost annihilated and peas very materially reduced.

The following table gives the results of the different kinds of ploughing:—

Crop.	Deep ploughing.					Country ploughing.				
	Area.	Cost of ploughing.	Total cost.	Outturn.	Value.	Area.	Cost of ploughing.	Total cost.	Outturn.	Value.
	A. r. p.	Rs. a. p.	Rs. a. p.	Mds. s.	Rs.	A. r. p.	Rs. a. p.	Rs. a. p	Mds. s.	Rs.
Pedigree wheat...	1 0 1	3 15 11	32 13 10	38 1	13	1 0 1	4 13 4	31 4 1	26 9	11
Country ditto ...	5 2 9	26 11 1	210 6 10	305 9	181	5 2 9	32 7 8	220 15 8	269 34	141
Barley ...	2 1 5	12 5 3	66 0 8	88 26	92	2 1 5	12 3 10	64 8 4	80 29	83
Barley and gram,	3 1 19	8 0 0	51 15 9	63 14	56	3 1 19	6 15 11	51 0 3	54 39	52
Gram ..	4 1 2	15 0 8	72 9 10	49 5	40	4 1 2	13 8 0	73 2 2	40 0	31
Oats ...	1 2 4	2 13 10	33 13 1	89 10	71	1 2 4	1 9 6	28 8 11	83 26	68

The cost of country ploughing is more than the English for two reasons: (1) by employing hired cattle, which are paid at 8 annas per day; (2) that the number of ploughings given to country-ploughed lands is more than that given with English ploughs Besides this, it must be taken into consideration that, unless very strictly supervised, the amount of work done by hired labourers varies considerably. Hence in the wheat a difference of Re. 1-1-9, and in gram of Re 0-8-4, which by the field-book is seen arises from hired labour costing more on some days than on others.

The following shows the results per acre:—

Crop.	Deep ploughing.				Country ploughing.			
	Cost of ploughing.	Total cost.	Outturn.	Value.	Cost of ploughing	Total cost.	Outturn.	Value.
	Rs. a. p.	Rs. a. p.	Mds. s.	Rs a. p	Rs. a. p.	Rs. a. p.	Mds. s.	Rs. a. p.
Pedigree wheat	3 15 6	32 10 6	37 31	12 14 8	4 13 2	31 1 1	26 2	10 13 1
Country ditto ...	5 2 8	37 1 9	54 37	32 9 2	5 13 6	39 19 4	48 22	25 6 0
Barley ...	5 6 5	28 6 5	38 34	40 5 3	5 5 10	28 1 11	35 15	36 6 1
Barley and gram ...	2 5 11	15 5 2	18 32	16 9 11	2 2 1	15 2 1	13 32	15 6 11
Gram ...	3 8 5	17 0 6	10 31	9 3 1	3 1 2	17 2 3	9 21	7 4 0
Oats ...	1 14 0	22 2 9	58 20	46 8 11	1 0 4	18 11 7	54 34	44 9 5

The following compares the results of using bullock's dung and poudrette manure:-

Crop.	Lands manured with bullock's dung.					Lands manured with poudrette.				
	Area.	Cost of manuring.	Total cost.	Outturn.	Value.	Area.	Cost of manuring.	Total cost.	Outturn.	Value.
	A. r. p.	Rs. a. p.	Rs. a. p.	Mds. s	Rs. a. p.	A. r. p.	Rs. a. p.	Rs. a. p.	Mds. s	Rs. a. p.
Wheat ...	1 2 4	14 12 0	55 10 5	65 10	40 0 0	0 3 26	10 0 1	30 7 0	31 16	20 0 0

The result per acre is as under :—

Crop.	Lands manured with bullock's dung.				Lands manured with poudrette.			
	Cost of manuring.	Total cost.	Outturn.	Value.	Cost of manuring.	Total cost.	Outturn.	Value.
	Rs. a. p.	Rs. a. p.	Mds. s.	Rs. a. p	Rs. a. p.	Rs. a. p.	Mds. s.	Rs. a. p.
Wheat ...	9 10 9	36 7 10	42 31	26 3 8	10 15 5	33 5 2	54 16	21 14 8

22. *Australian wheat.*—Fifteen seers of Australian wheat, received from Dr. Bonavia of Lucknow for experimental sowing, was sown on acre 0-2-3 within the garden enclosure. The plant was magnificent, attaining the height of 5 feet, but requires a large quantity of water and ripens late. This crop was also attacked with the blight, and the yield was 3 maunds 36 seers of grain and 22 maunds of bhúsa.

23. Half a pound of *motia* wheat was received for sowing and produced 5 seers of grain. The plants grew well and were robust and strong, but did not escape blight. Produce kept for seed.

24. An attempt was made to cross the white Jabalpur and the country *dúdia* wheat, and for this purpose 100 seeds of each were selected and sown one foot apart. The best ears have been kept as seed for next year.

25. *Barley.*—Five seers of a small grain barley sent by Mr. Nicholson of Mirzapur (variety unknown) was sown on acre 0-2-4 of garden land, which produced 3 maunds 22 seers of grain and 10 maunds of bhúsa.

26. *Oats.*—This is a paying crop and gets a ready sale. Some loss was caused this year by the grains not being reaped till somewhat overripe. Produce and expenses shown in table, para. 21.

27. *Cotton.*—Two acres of land were sown with acclimatised Hinganghát seed on the 15th July. The weather being dry, the seed was sown on flats in rows 2½ feet apart and 2½ feet in the row, was watered four times, and hoed twice. The plants throve better than was expected, and picking began on 10th November and continued to the 8th February. The yield was very much reduced by frost. The following is the result :—

Crop.	Area.	Cost of cultivation.						Outturn.		Remarks.
		Cost of manuring.	Cost of ploughing	Cost of watering.	Cost of sowing.	Miscellaneous cost.	Total.	Quantity.	Value.	
	A. r. p.	Rs. a. p.	Rs. a. p	Rs. a. p	Rs. a. p.	Rs a. p.	Rs. a. p	Mds. s.	Rs. a. p.	
Cotton ...	2 0 0	12 12 6	5 14 1	35 13 10	2 6 0	21 14 8	78 13 1	10 24	106 0 0	

28. *Country cotton.*—Half a pound of improved country cotton received from Lucknow for experimental sowing was sown on 1,650 square yards of land within the garden enclosure; the produce in uncleaned cotton was 2 maunds 16 seers.

29. *Bahmia cotton.*—Thirteen plants of this were reared, and the results reported on (*vide* this office No. 57, dated 18th March, 1878).

30. *Hariáli grass.*—1,230 square yards of this was planted, and a separate report submitted of the results.

31. *Sugarcane, Burmah.*—Garden No. 2 was sown; the following shows the results :—

Crop.	Area.	Cost of cultivation.						Amount realized from sale.
		Cost of manuring.	Cost of ploughing.	Cost of sowing.	Cost of weeding.	Cost of watering.	Total cost.	
	A. r. p.	Rs. a. p.	Rs a. p	Rs. a. p.	Rs. a. p.	Rs. a. p	Rs. a. p	Rs. a. p.
Sugarcane ...	1 0 0	5 14 4	2 7 4	49 12 11	9 0 0	21 10 0	88 12 7	277 0 0

32. Six plots of lands, 240 feet long and 80 feet wide, were selected for sundry experiments, and each of these was divided longitudinally into two plots, forming 12 plots, 240×40 feet; six of these plots (240×40) were subsoil drained and six undrained.

33. Two plots drained and two undrained were trenched 2 feet deep; the one manured, the other unmanured.

34. Two others drained and undrained were ploughed with English plough; one manured and the other unmanured.

35. Two drained and undrained were cultivated solely with country plough; one manured and the other unmanured.

36. The 12 plots (240×40) were each again laterally subdivided into four kiaris or beds 60×40 feet, and numbered consecutively and sown as follows :—

From Nos. 1 to 12, wheat.
„ „ 31 „ 24, barley.
„ „ 25 „ 36, peas.
„ „ 37 „ 48, gram.

37. The first beds sown was the gram, which germinated well and grew so luxuriantly that it had to be pruned, or rather have its branches topped several times, but eventually was all destroyed by blight and caterpillars. The experiment, however, showed that it is a mistake to sow gram on a newly-manured field, since the plants run to leaf rather than seed. The peas on plots Nos. 25 to 36 were ploughed in with grass manure. The outturn is given in the following table :—

Crop.	Number of plot.	*Unmanured cultivation.*			Number of plot.	*Manured cultivation.*		
			Grain.	Bhúsa.			Grain.	Bhúsa.
			Mds. s.	Mds. s.			Mds. s.	Mds. s.
Wheat.	1	Country ploughed ...	0 15½	2 14	2	Country ploughed ...	0 18	2 20
	3	Country ploughed and drained.	0 12	1 38	4	Country ploughed and drained	0 19	2 27
	5	English ploughed ...	0 21	2 19	6	English ploughed ...	0 14	3 23
	7	English ploughed and drained.	0 13	3 25	8	English ploughed and drained.	0 16	4 0
	9	Trenched ...	0 19	3 2	10	Trenched ...	0 18	2 13
	11	Trenched and drained ...	0 26	3 33	12	Trenched and drained ...	0 27	3 23

Crop.	Number of plot.	*Unmanured cultivation.*	Grain. Mds. s.	Bhúsa. Mds. s.	Number of plot.	*Manured cultivation.*	Grain. Mds. s.	Bhúsa. Mds. s.
Barley.	13	Country ploughed ...	0 36	1 10	14	Country ploughed ...	0 30	2 7
	15	Country ploughed and drained.	1 10½	1 36	16	Country ploughed and drained.	1 9	2 14
	17	English ploughed ...	0 38	1 10	18	English ploughed ...	1 13	3 0
	19	English ploughed and drained.	1 31	2 11	20	English ploughed and drained.	1 28	2 34
	21	Trenched ...	1 15	1 35	22	Trenched ...	0 30	1 22
	23	Trenched and drained ...	1 32	3 2	24	Trenched and drained ...	1 32	3 34
Peas.	25	Country ploughed ...	Ploughed in with grass manure and sown with sugarcane.		38	Country ploughed ...	Ploughed in with grass manure and sown with sugarcane.	
	27	Country ploughed and drained.			40	Country ploughed and drained.		
	29	English ploughed ...			42	English ploughed ...		
	31	English ploughed and drained.			44	English ploughed and drained.		
	33	Trenched ...			46	Trenched ...		
	35	Trenched and drained ...			48	Trenched and drained ...		
Gram.	37	Country ploughed ...	0 4½	0 33	38	Country ploughed ...	0 1½	2 2
	39	Country ploughed and drained.	0 4½	0 35	40	Country ploughed and drained	0 1	0 38
	41	English ploughed ...	0 10	1 8	42	English ploughed ...	0 4½	1 23
	43	English ploughed and drained.	0 5	1 20	44	English ploughed and drained.	0 6½	2 26
	45	Trenched ...	0 4	1 29	46	Trenched ...	0 4	2 3
	47	Trenched and drained ...	0 11½	3 10	48	Trenched and drained ...	0 9	2 6

38. It will be seen from the above that there are great differences between the produce of the various plots; this I attribute to the pilfering that took place during threshing and dressing. The discrepancies being so glaring, a strict watch was kept and the pilfering detected, after which differences in the outturn were not so noticeable. This makes the result of the experiment very unsatisfactory.

39. It is a mistake to form such small plots as 60 × 40, as no plough—not even a native one—can be effectively used in so small a space, which is only fit for spade cultivation.

40. *Live stock.*—Three pairs of buffaloes have been added during the year to the working stock of the farm, and three old Brahmini bulls have died from old age. The working stock is given below—

(1) Large bullocks	...	...	10
(2) Buffaloes	...	...	7
(3) Bulls	...	...	3
(4) Heifer	...	...	1

41. *Sheep.*—The following shows the increase in this stock and the amount realized by sale of wool. No sheep have been sold this year, but 14 half-bred rams, ranging from two to three years old, have been distributed. The wool yield this year was 1 maund 21 seers, which realized Rs. 13 per maund:—

Stock on 1st April, 1877.	Increase during year.	Total.	Distributed.	Died.	Balance on 31st March, 1878.	Amount realized from sale of wool.
						Rs. a. p.
102	36	138	14	12	112	14 12 6

The quantity of manure collected from the farm stock during the year amounted to 46,800 tons.

43. *Dead stock.*—The stock under this head does not differ much from the inventory of last year. Two new B. F. O. ploughs and two of Messrs. Thomson and Milne's patent sugarcane mills and a patent corn-dresser have been added. There were five one-bullock carts of the English pattern, all out of repair, and four out of the five totally useless. These have all been repaired, painted, and put in thorough working order.

44. The bullock water-lift, built of wood and iron, was worn out and became useless; this has been newly constructed of iron entirely and put together with its gearing in efficient order.

45. The masonry drain within the garden enclosure that conveys the water supplied by the canal to the tank was found to be on too high a level, scarcely giving a fall of one inch, and consequently obstructed the flow from the Kaliánpur rájbaha. This has been sunk 11 inches and the communication with the tank improved and iron sluices put in, to enable the flow to be regulated as required. The masonry distributary drains within the garden enclosure had their annual repairs done to them.

46. The statements E I II and III, showing the financial accounts of the farm, are herewith enclosed (in MS.)

APPENDIX II.

Report on ploughs by MR. J. PHILLIPS, *Superintendent, Government Experimental Farm, Allahabad.*

WITH regard to the ploughs introduced into this farm, the American plough lately received is perhaps of all we have tried the most suitable, either for introduction to native cultivators or for general farm purposes; it is of very light draught, being only 40lb. in weight. It is supplied with a shovel-plate and three sizes of tongue-points. The shovel-plate is very useful, indeed, for ploughing light lands or finishing after the *land has been* partially prepared.

Immediately on the arrival of this plough one pair of our *best* bullocks were put into it, and they ploughed half an acre of land in three hours; the work was well done and equal, in my judgment, to six or seven, or more, times ploughing with the native plough. The bullocks however, without beingchanged, would not be able to continue at this rate daily, but they have ploughed a little over one acre daily this last week without being reduced in the least; by changing the bullocks every half day this plough, with one pair of good bullocks at a time, or two pairs of common native bullocks, can easily plough 1½ acres of land. This is just about double of any other plough which we have yet tried.

The above remarks apply to rather light or partially prepared heavy lands, but when fitted with the mould-board this plough is capable of preparing almost any soil, excepting very stiff clay, for which Howard D2 with extra draft is the best. (The D2, being a very powerful plough and not too heavy, gets underneath the hard crust of soil and turns it up in large cakes).

The tongue-point attached to the American plough will also be very useful for half sub-soiling and turning up the surface of night-soil when deodorized in trenches on our Municipal Farm. The opening on a furrow will first be made with the usual mould-board, to be followed in the same trench by the tongue-point. The first plough will just reach the surface of the manure, and the tongue-point will be able to turn up a good part of it to mix with the surface soil, and will thus be of great benefit in bringing the newly trenched land quickly into good condition. One of the drawbacks of newly trenched soil being the necessity of having the inert soil from the bottom of the trench on the surface, the surface or condition soil naturally going to the bottom of the trench to mix with manure, and the unconditioned bottom soil coming to the surface, this tongue-point will now obviate this in a great measure, as it will bring up and mix manure with the inert soil of the surface. Altogether this is a very handy little plough, but its capabilities would, in my opinion, be greatly increased if it were fitted with a wheel, which is being done with the one received.

Further particulars will be forwarded after trial, but I will give the cost of ploughing with it now as well as I can. Cost of ploughing with this plough per acre with shovel-plate about 9 annas, with mould-board about Rs. 1-2-0. Thus two pairs of bullocks changed every half day: feed of bullocks—gram, 4 seers, 4 annas; bhusa, 40 seers, Re. 0-5-6; two men, 4 annas; total, Re. 0-13-6 for 1½ acres, per acre 9 annas, with the mould-board about ¾ acres per day, or Rs. 1-2-0 per acre.

The B. F. O. plough (which is 51lb. weight) is our next best for common purposes: it is of light draught, has no extras attached, is suitable to be worked with one pair of good bullocks or buffaloes or two pairs of common bullocks. This I considered the handiest plough we had till we received the American one. It ploughs about ¾ths of an acre per day, while the American one does 1½ acres with the shovel-plate attached, but with the common share attached it does not plough quite so much as the B. F. O. Cost of ploughing per acre about Re. 1-2-0.

The Turnerest is also a handy little plough (66lb. weight) for light soils, is easily drawn by a pair of medium-sized strong bullocks; but as the ploughshare is made all

in one piece, *i.e.*, without a removable point, it soon wears out and the plough wants renewing ; and being generally required for sandy light soils, the point of the ploughshare soon wears down, becomes blunted, and does not catch the ground properly. This is a fatal objection to it, otherwise it is a handy light plough, and being light, might soon recommend itself to the native cultivators.

The Stalkart plough (105lb. weight) would be a good plough with a few alterations. It is much longer in the ploughshare than either the American or B. F. O., and consequently has a greater purchase when once it has penetrated into the ground. However, what it gains in that point it loses on the other hand by having a greater quantity of soil before it to turn over; the setting also of the plough is not correct, if the one here is a true sample. The point of the plough projects too much into the ground and the shaft is too high ; this naturally propels the plough into the ground and not through it, and thus expends the draughts in a wrong direction. The shaft is also made in the same way as that of a native plough fixed on the *juah* or yoke, and being a large and heavy plough, the driver cannot get so near the bullocks when working it as he can when driving the native plough ; he therefore cannot reach sufficiently forward to twist the tails of the bullocks to urge them on when requisite. Even when an extra man is put on to drive the bullocks, the driver cannot reach over past the shaft to urge on the opposite bullock; if, however, the shaft was cut, the plough fitted with a wheel, and the point lifted, this plough would make a good strong useful plough for ploughing rather heavy soils. Cost of ploughing per acre Re. 1-2-0.

The Madras Combination plough is also a very handy light plough (51lb. weight), but it has the same objection with regard to the long shaft as Stalkart's, and, like the native plough, it has no wheel. It is, however, better set and is not of such heavy draught. This plough is suitable for ploughing light or medium stiff soils. Cost of ploughing per acre about the same as the B. F. O.

Howard's D2 cotton plough. This is the plough which is generally used on this farm for the first ploughing or for covering manure. It is heavier, being 200lb. weight, and more expensive, and requires three good strong bullocks to drag it, and in the hot weather, on heavy stiff land, four pairs ; but it is the only plough of medium size we have with which stiff land can be ploughed, and therefore is of great value for covering in manure and for ploughing during the hot weather, when the ground is hard and baked. At this time almost all other work is stopped and bullocks are idle, so that all the ground ploughed now is so much saved at sowing time for good cultivation. This is the only plough for ploughing clay or heavy lands we have, but for general purposes and native cultivators in India, and for preparing light land quickly, the American is, as I have said before, the best we have yet received. Cost of ploughing with D2 plough about Rs. 3-1-0 per acre, *viz.*, feed of three pairs of bullocks Re. 1-0-6 per day, four men Re. 0-8-0, total Re. 1-8-6, at the rate of half an acre per day, per acre Rs. 3-1-0. During the hot weather, one extra pair of bullocks would make the total per acre of Rs. 3-6-6. This ploughing, however, during the hot weather, is of great benefit, as explained in my annual report, all the ground ploughed now being so much saved at sowing time, when every bullock is busily employed, as the ground has only to be run over once or twice with the native plough and it is fit for sowing, thus allowing about double the quantity of ground to be prepared than we would otherwise be able to prepare with the same number of bullocks, as well as greatly increasing the crop, by enriching the soil with an early atmospheric exposure.

As I have already explained in my annual report, the cost of native ploughing is from Re. 0-13-0 to Re. 0-14-0 per acre ; hiring rate Re. 1.

ORDERS OF GOVERNMENT.

No. 663 of 1879.

From

The SECRETARY to GOVERNMENT,
North-Western Provinces and Oudh,

To

The DIRECTOR of AGRI. and COMMERCE,
North-Western Provinces and Oudh.

Dated Allahabad, the 22nd March, 1879.

Sir,

Revenue Department. I am directed to acknowledge the receipt of your No. $\frac{205 \text{ A.}}{\text{II.}}$, dated 13th November, 1878, with enclosures (which did not reach this office till the 22nd January, 1879), being the report on the Government Farms at Allahabad and Cawnpore for 1877-78, and to communicate the following remarks:—

2. The year, owing to its deficient rainfall, was extremely unfavorable to agricultural operations generally, and hence the experiments at both farms were, as regards outturn, more or less failures when contrasted with the results previously obtained. It must be borne in mind, however, that improvements which can enable the cultivator to raise a crop in a season of drought are as urgently required as any. In an ordinary or favorable year, he is already able to do this in his own way without any teaching. An important object to be aimed at is to discover how crops can best be secured against seasonal vicissitudes, and from this point of view, a dry year affords the best possible test of the results achieved.

3. Operations at Allahabad were carried on in—

(1) the experimental farm;
(2) the municipal sewage farm;

and are dealt with by you separately under each head.

(1) The area reserved for experiment was 30 acres 7 roods 2 poles, cropped as follows:—

	A	r.	p
Sorghum	11	2	2
Júar	4	2	2
Bajra	7	2	0
Barley...	5	1	1
Sugar-cane	1	0	0
Hariali grass	1	0	0

and the object of the experiments was to show the effects of—

(1) Deep ploughing.
(2) Early and late ploughing.
(3) Manure.
(4) Thin sowing.

As remarked in para. 2, the year was one of drought, and the outturn, as compared with ordinary years, generally a failure in consequence. But the superiority of the English over the native plough, and of early over late ploughing, was forcibly demonstrated. Experiments of the latter kind were confined to sorghum alone, but so far as they went were highly successful. Mr. Phillips writes in his report, forwarded by you in manuscript, "This has given an outturn of, on the early ploughing, 222 maunds of karbi per acre, on the late ploughing, 105 maunds 30 seers per acre, while with the common native plough the outturn has only been 80 maunds 33 seers per acre; showing, as has been maintained in former reports, that with careful cultivation and deep ploughing a kharíf crop can be commanded in the most trying season without the aid of irrigation."

You think there are difficulties in the way of the general introduction of early ploughing; but the experiments should be continued and extended to other crops as you propose. If Mr. Phillips is right, as he would appear to be, in his contention, the importance of making the advantages of the system he advocates generally known to the cultivating community cannot be over-estimated.

4. The results with other crops do not call for any detailed notice. With juar the superiority of the English plough was shown as with sorghum, and, it may be remarked, manure actually decreased the outturn, owing, it is supposed, to the heat. Wheat and barley were comparative failures and *Reana luxurians*, cuzco maize, oats, and Bakli beans did not come up at all from want of moisture. No definite conclusions were arrived at with regard to hariali grass, but the experiments are to be continued next year side by side with dúb.

5. So far as experiments with manure went, they appear to be favorable to poudrette. The quantity used, however, is not stated, and the omission should be supplied in future.

Thin seeding was tried with wheat and barley, and Mr Phillips claims to have proved that this system is better than the ordinary method of sowing. The experiments may be continued, the results being carefully noted, to show if his conclusion may be accepted.

6. The experimental farm nearly succeeded in paying its way as you intended, receipts being Rs. 3,281 against expenditure Rs. 3,354, excluding the superintendent's salary. The grant of Rs. 4,000 was utilized at Cawnpore in purchasing additional land and buildings for the farm there.

7. The Lieutenant-Governor is aware that you do not anticipate much benefit can be derived from an experimental farm at Allahábad, owing to want of irrigation, the exceptional character of the soil, and other causes. If you see no reason to modify the opinions previously expressed by you to this effect, I am to ask that you will submit definite proposals, either for giving it up altogether or for such other arrangements as you may deem best, for the consideration of Government.

8. The object of the municipal sewage farm is to discover the best mode for disposing of latrine manure and dry sweepings, both from a sanitary and financial point of view.

The method pursued so far is for the municipality to send all their latrine manure to land under Mr. Phillips, where it is put into shallow trenches. The land is then prepared for crops, and let out by auction to the highest bidder.

The statistics given in paras. 26 31 of your report show that this has been done most successfully with regard to financial results, and no sanitary objections are said to have been raised. Assuming that the municipality must in any case bear the expense of carting away the manure, which should be left out of the account, it is shown that, while the cost of preparing an acre for cultivation, even in an exceptionally bad year, was only Rs. 22-15-9, the municipality obtained an increase on the original rent of Rs. 22 per acre, *i. e.*, its outlay was recouped in the very first year of letting, and the increased rental in subsequent years remains as clear profit. You calculate the sewage of 100,000 people will supply sufficient manure for 25 acres a year, and that the letting value of the land will be increased by at least Rs. 20 per acre, and if irrigation is available by very much more. From this you argue it would be highly advantageous to municipalities to buy up land in the vicinity of their towns, and, by disposing of their sewage in the way indicated above, secure to themselves a considerable permanent income. At Allahabad the land has had to be hired on a ten years' lease, at the end of which the benefits of its increased productive powers will be reaped by the original owner.

Sir George Couper is not at present prepared to express any definite opinion on your proposals. There can be no doubt, however, that the matter merits most attentive consideration by all municipalities, and His Honor fully recognizes its importance, and the good service that has been done in working out the experiment. In accordance with the orders of the Government of India, you have recently been asked to prepare a memo. on the subject for circulation, which will give you an opportunity of fully expounding your views. I am to ask that this may be submitted as soon as possible, when the question will be further considered.

9. Equally good results were obtained financially with dry sweepings, a profit of Rs. 29-2-2 per acre having been realized. The problem with these is—how to take the manure cheaply to a distance where the supply is less abundant, and where land can be procured in a sufficient quantity free from sanitary objections. In some places a cheap tramway might enable this to be done. It would probably be unsafe to saturate large areas near a city with night soil, and it must be removed to a considerable distance, which makes the cost of carriage excessive.

10. The balance-sheet in para. 37 shows a net profit of a little less than Rs. 7,000 as having been received by the municipality from the sewage farm up to the 31st May, 1878, of which it takes the entire risk, defraying all the expenses and receiving all the profits.

The receipts for the agricultural year were Rs. 3,290-4-8, and the expenses, exclusive of rent, Rs. 1,576-4-3, leaving a surplus of Rs. 1,714-0-5.

CAWNPORE FARM.

11. Mr. Unsworth managed during the year, and wrote the report, which has been printed in full. He has since left, and Mr. W. H. Smith was temporarily appointed in his place. A permanent incumbent has at last been found in Mr. Tresham, who is now in charge.

12. Your office was transferred to Cawnpore during the year, and, with the sanction of Government, the buildings and lands occupied by the orphanage schools of the Society for the Propagation of the Gospel were purchased for Rs. 4,000 and added to the farm after the close of the year. You will now be able to exercise more close and constant supervision over the work going on.

13. The total area actually under management was—

170 acres 2 roods 35 poles, of which 54 acres 11 poles belong to Government, and 116 acres 2 roods 24 poles were leased. Of the latter 6 acres 2 roods 22 poles form part of the municipal farm, and were used for experimental wheat cultivation. Operations are divided under three heads—

Fruit garden.
Flower garden.
Farm.

A brief abstract of the results under each is given in your review.

14. There is little to call for special comment. Grapes, jack-fruit, and mangoes again proved highly remunerative, while strawberries failed completely.

His Honor hopes next year may prove more favorable to the enterprise of those municipalities who are willing to adopt the suggestions made in the circular issued by Government last year for the formation of fruit gardens.

15. The flower garden has been transferred to Lucknow, and calls for no comment. His Honor notices, with satisfaction, your efforts to secure the extended growth of ornamental shrubs and creepers alluded to in para. 58. The question of arboriculture generally is being separately discussed in connection with the proposed establishment of forest and nursery gardens for trees.

16. The outturn of the various crops experimented with was so much affected by the drought, which was most severely felt at Cawnpore, as to prevent any useful conclusions being arrived at. Wheat was a complete failure, except with country seed, but, as at Allahabad, the English plough proved itself greatly superior to its native competitor. It does not appear that any experiments with early and late ploughing and thin sowing were made, and I am to suggest that this should be done, to see if the results on the Allahabad farm are confirmed. Experiments are still being made with water-lifts, and Messrs. Thompson's new sugar-mill has been offered to cultivators on easy terms. His Honor has recently sanctioned the making of advances for its purchase in Gházipur, and

trusts that your anticipations as to the higher class of sugar it will turn out may be confirmed in such a way as to secure its popularity.

17. Little could be done towards introducing English ploughs on Court of Wards estates, owing to the drought. With reference to your remarks in connection with these estates, in para. 68, I am to refer you to the orders of Government sanctioning the appointment of Mr. Benson as manager of the Awa property. You have there been asked to draw up a comprehensive scheme for carrying out all the objects Sir J. Strachey had in view when the department over which you preside was created, and the Board have been desired to give you every facility for doing this. It now rests with yourself to bring into actual working the measures you have so long advocated. Sir George Couper desires me to call your special attention to the relationship which should exist between the Government farms and the Court of Wards estates, referred to in para. 11 of the Government Order, *viz.*, "While the former must be utilized chiefly in teaching experience to Government, and in proving what experiments are likely to meet with success and what with failure, the latter should be employed in reproducing, for the education of the agricultural classes, any of those experiments in which success has been attained." Established results each year should be stated in the form of brief clear propositions for practical application, and it should be shown how far actual progress with any has been made on the Court of Wards estates, and which it is intended to introduce. So far it would seem the success of deep and early ploughing and thin seeding has been sufficiently established to warrant their trial on a more extended scale. The formation of fruit gardens, and of nurseries for trees and ornamental shrubs, might also be taken in hand on estates which offer a suitable field for these and such like improvements. Sir George Couper will look forward with great interest to your action in this respect, which should be fully detailed in future reports.

18. Mr. Phillips' memorandum on the various kinds of ploughs experimented with is a useful contribution towards the investigations which are being made with a view to the construction of a plough suited to the ordinary cultivator. It is believed you have recently succeeded in devising one which can be made at a trifling cost, and is at the same time effective, and almost as easy to work as the native plough. His Honor will be glad to hear what form is ultimately decided on for general adoption. If deep ploughing can be introduced, it will undoubtedly be a great stride in advance, and a plough which renders this possible is one of the best gifts which could be bestowed on the agricultural classes.

19. The financial results for the Cawnpore farm are not given separately, but for both farms the accounts stand thus—

Receipts.

	Rs.
Imperial grant for pay of superintendents	9,000
Provincial grant of Rs. 4,000 for each farm	8,000
Sale of farm produce	8,998
Total ...	25,998

Expenditure.	Rs.
Salaries of superintendents	7,800
Cost of operations	10,128
Orphanage lands, &c.	4,000
Wells	1,000
Cattle-sheds	500
Carriage of machinery	250
Cattle	500
Rams	500
Seed	279
Total ...	24,957

leaving a surplus of Rs. 1,041. It is not stated whether this represents cash in hand or the undrawn balance of the Government grants. The cost of operations exceeded the receipts from sale of produce by only about Rs. 1,100, and the experiments were carried on at a comparatively small outlay, and that, too, in a season when the ordinary cultivator found it impossible to pay his way. The Lieutenant-Governor agrees with you that no profit can, or should, be expected from an experimental farm; but it must not be forgotten that it is all-important to know what experiments do yield a profit, as it is on this that their ultimate value entirely depends. On the whole, Sir George Couper is satisfied that the farms under you are doing good work, and that progress in the right direction is being gradually made.

20. With reference to a recent Resolution of the Government of India, you have been asked to consider and report whether the time has come when paid or unpaid apprentices might be with advantage attached to the Government farms to learn the system pursued there.

21. In maintaining these farms, Sir George Couper desires that they should serve not only as a means for the conduct of agricultural experiments on the part of Government, but also as a stimulus to agricultural enterprise generally, and that others should be induced to follow in the same path. For this reason I am to ask that you will make your annual report as complete as possible in itself. Mr. Phillips' report and your subsequent correspondence with him have been forwarded by you in manuscript. This practice is in many ways inconvenient, and should be avoided in future All the information which you desire to place before Government should be incorporated in the report itself. I am to observe that in June, 1874, rules for the conduct of operations in model farms were drawn up by the Board during your tenure of the office of Secretary. The points on which information was to be given in the annual reports were also laid down, and statistical forms, &c., prescribed for showing the results of experiments. The present report does not appear to have been drawn up in accordance with these rules, and it may be that they do not now approve themselves to you. But I am to suggest that you should draw up a revised set, with any modifications you may think fit, which may serve as a guide to all who are interested in the management of farms. His Honor thinks it highly important that a uniform set of statistical tables should accompany each report, and that results should

be tabulated year by year on the same plan to facilitate comparison, and to preserve the experience acquired. A manual for the conduct of operations, drawn up as above, would be most useful to managers of estates under the Court of Wards and others who may be desirous of co-operating with you, as it is only by recording results on a uniform and systematic plan for an extended period that really trustworthy conclusions can be arrived at.

I have the honor to be,

SIR,

Your most obedient servant,

C. ROBERTSON,

Secretary to Govt., N.-W. P. and Oudh.